

Profitability of Insider Trades in Extremely Volatile Markets: Evidence from the Stock Market Crash and Recovery of 2000-2003

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In this paper we examine the profitability of corporate insider trades in the volatile markets of 2000-2003. Insiders are known to be contrarian traders. We hypothesize that profits from both contrarian trading and from trading based on useful inside information are large in volatile markets. We find that insider purchases are negatively related to firm size and recent stock returns and positively related to the firm's book-to-market equity ratio. Even after adjusting for contrarian trading, we find that insider trades generate significantly large future profits. This shows that insiders trade on useful private information and that such trades are profitable in volatile markets.

Introduction

The purpose of this paper is to examine the information content of reported corporate insider trades during the stock market crash of 2000-2002 and subsequent recovery in 2003. Insiders are known to be contrarian investors. [See Seyhun (1992), Rozeff and Zaman (1998), and Lakonishok and Lee, (2001).] But are insider trades motivated by useful inside information, or are they simply triggered by scaled price ratios (price-earnings or book-to-market ratios)? Manne (1966) and Carlton and Fischel (1983) argue that trading by corporate insiders fosters market efficiency by

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revealing insiders' private information about future prospects of their firms. There seems to be general disagreement in the empirical literature on the question of whether insider trades truly reveal managerial private information, or whether they simply reflect contrarian trading behavior by corporate insiders. Extremely volatile market conditions present an ideal experimental setting for examining this issue. If stock market investors were truly irrationally exuberant in the late 1990s and then became irrationally pessimistic during the big crash of 2000-2002, then contrarian trading behavior would clearly be profitable. Insiders, however, also could earn excess return by exploiting their superior knowledge about the future prospects of their firms, assuming that such private information had not already been incorporated in the stock prices.

To explore further, let us consider a hypothetical stock that has experienced significant price increase over some past time period. Suppose that this stock now commands a high price-to-earnings multiple (P/E) and a low book-to-market-equity (BE/ME) ratio. If insiders are pure contrarians, then under these conditions there should be more insider selling than buying in the stock, to the extent that is permitted by law. If insider trades are based upon their private information about future prospects of the firm, however, then their trades may or may not be contrarian in nature. If future prospects are still good, then insiders may purchase more of the stock even though the stock has experienced significant price increase and now has high P/E and low BE/ME ratios. If, on the other hand, future prospects are not good (or if all the good news have been priced into the stock already), then there may be net insider selling in the stock. Thus, trading by insiders that is based on private information may or may not be contrarian in nature.

There is extensive evidence in the literature that insider trading generates abnormal returns. [See Jaffe (1974), Givoly and Palmon (1985), Seyhun (1986 and 1992), Lin and Howe (1990), and Rozeff and Zaman (1998), among others.] The difficulty in disentangling the two possible sources of insider trading profits (contrarian trading versus superior information) is that these are not mutually exclusive propositions. One way to distinguish the two is to jointly examine the incremental explanatory power of insider trading variables and contrarian trading indicators (such as past stock returns and BE/ME ratios). Irrational trading behavior by market investors in extremely volatile markets (as were observed between 1999 and 2003) can magnify the profitability of both informed trading and routine contrarian trading. Because both sources of profits are likely to be magnified, such market conditions present an ideal experimental setting for examining the sources of gains from insider trading.

The empirical evidence in the literature on the sources of long-horizon insider trading profits is mixed. Several papers examine the ability of corporate insiders to time the market successfully in their personal trades and with their corporate decisions. Several of these papers conclude that insider trading and financing decisions are significantly correlated with subsequent stock returns. [For a partial list of such

studies see Seyhun (1990), Ritter (1991), Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Baker and Wurgler (2000), Kahle (2000), and Clarke, Dunbar, and Kahle (2001).] On the other hand, several other studies question the ability of insiders to time the market. [See Lee (1997), Brav, Geczy, and Gompers (2000), Eckbo, Masulis, and Norli (2000), Schultz (2003), Chan, Ikenberry and Lee (2003), and Butler, Grullon, and Weston (2005).]¹ Identifying the underlying sources of abnormal profits from insider trades remains a work in progress in the current literature.

Jenter (2005) attempts to discriminate between the two possible explanations of abnormal profits from insider trades. He finds no evidence of insider trading profits after adjusting for firm size and BE/ME (contrarian trading indicators). He concludes that managerial trading profits arise from contrarian trading behavior and not from utilization of useful inside information. By comparison, Piotroski and Roulstone (2005) find evidence that insiders are both contrarian traders and possessors of superior information. Insider trading is found to be significantly correlated with future firm performance, even after controlling for contrarian trading behavior. Contrarian trading behavior, however, seems to be a more important explanation of insider trading profits than is useful inside information. Lakonishok and Lee (2001) find only limited evidence of insider timing ability after controlling for insiders' tendency to trade in a contrarian manner (i.e., after adjusting for firm size and BE/ME).

The differences in the results in these papers can be attributed to different time periods examined and to different methodologies and datasets used. Given these mixed results in the literature on this issue, a re-examination is warranted. We examine this issue against the backdrop of extreme market volatility from 1999 to 2003. As discussed earlier, profits from successful contrarian trading, as well as from useful inside information, can be magnified in volatile markets, giving us a better chance of being able to discriminate between the two scenarios.

Our results show that trading by corporate insiders is significantly correlated with future market-adjusted returns of their stock. Before adjusting for contrarian trading behavior by insiders, stocks that had only insider purchases in a year outperformed those with only insider sales by 22.5 percent in the following year. After adjusting for firm size, BE/ME, and recent return, the return differential drops to 13.9 percent. These profits are larger than those that have been reported generally in the literature. Interestingly, Seyhun (1990) reports 12-month post-October 1987 market beta-adjusted return differential between purchases-only and sales-only

¹Several papers also examine whether outsiders can earn abnormal profits by mimicking insider trades. Perhaps not surprisingly, the evidence here also is mixed. Seyhun (1986) and Rozeff and Zaman (1988) conclude that outsiders cannot earn abnormal return by imitating insider trades, net of transaction costs. By contrast, Bettis, Vickrey, and Vickrey (1997) conclude that outsiders can earn abnormal returns, net of transaction costs, by trading on publicly available information about large insider trades.

insider transactions of 17.2 percent. It appears from these results that insider trading can lead to relatively large post-trading returns in extremely volatile markets even after adjusting for contrarian trading behavior. We interpret these results as being consistent with insiders trading on useful non-public information.

Data and Methodology

Sample Construction

We obtain our insider trading data from two sources. We extract insider trading data for 1999 and 2000 from the Ownership Reporting System (ORS) data files that are compiled by the Securities and Exchange Commission (SEC).² Insider trading data for 2001–2002 are from Thomson Financial. Following the literature, we apply several filters to the data. [Similar filters have been used by Seyhun (1986 and 1990), Rozeff and Zaman (1998), Lakonishok and Lee (2001), Clarke, Dunbar, and Kahle (2001), Chan, Ikenberry, and Lee (2003), and Piotroski and Roulstone (2005).] We examine only open market and private insider purchases and sales. We cannot distinguish between open market transactions and private transactions because both the ORS data and the Thomson Financial data report combined open market and private transactions. Transactions that are related to grants, awards, gifts, dividend reinvestments, and acquisitions or dispositions by will or under employee compensation plans are dropped from the sample. Seyhun (1990) argues that these other types of trades do not occur for information reasons.

The SEC typically classifies insiders as officers, directors, persons with policy-making roles in the firm, and large shareholders (those who own at least 10 percent of the outstanding shares). We examine trading in common or ordinary shares. The data are from SEC forms 3, 4, and 5. We exclude all transactions with missing CUSIP numbers, missing transaction dates, and data that are tagged as amended or inconsistent data. Following Lakonishok and Lee (2001) and Clarke, Dunbar, and Kahle (2001), we also exclude transactions with fewer than 100 traded shares in order to focus on the more economically meaningful events. The final sample consists of 482,740 reported insider trades between 1999 and 2002.

The insider trading data are next merged with CRSP/Compustat data. Our goal in this paper is to examine the information content of reported insider trades. We do this by examining the relationship between insider trades in a given stock in year t (1999–2002) and the market-adjusted return on the stock in year $t+1$ (2000–2003).³

²Data available from the U.S. National Archives.

³The methodology is borrowed from Piotroski and Roulstone (2005), who examine the association between insider trading in year t and the firm's future cash flow realizations in year $t+1$ during the 1990s. Lakonishok and Lee (2001) and Seyhun (1992) use predictive regressions for various holding periods to examine the ability of insider trades to predict future stock returns. Both of these papers report that the highest predictive ability of insider trades is observed for 12-month post-trading time horizons.

Thus, insider trading data for year t are merged with CRSP/Compustat data for year $t+1$. The merged sample has 9,435 distinct firm-years of observations.⁴ When we impose the additional requirement that CRSP/Compustat data for year t must be available for the firms to remain in the sample, the sample is further reduced to 8,824 firm-years.

We use the merged CRSP-Compustat data files to assign all firms into three size groups and three book-to-market-equity (BE/ME) groups each year. At the beginning of each year, all firms with data in both CRSP and Compustat are assigned to one of ten size portfolios based on market capitalization.⁵ Following the methodology in Lakonishok and Lee (2001), we assign all firms in the three smallest size deciles to the small firm portfolio. Firms in the next four size deciles are assigned to the mid-size portfolio, whereas all firms in the three largest size deciles make up the large-firm portfolio. All firms on the merged CRSP-Compustat files are also independently assigned to three BE/ME portfolios each year using an analogous procedure. The final sample consists of 2312 small firms, 3426 mid-size firms, and 3086 large firms. The numbers of firms in the three size portfolios are not equal because the size portfolio ranks are assigned based on available data for all firms in the merged CRSP-Compustat files. Our final sample also has 2439 value firms (in the highest-ranked BE/ME portfolio), 3430 firms in the medium BE/ME portfolio, and 2955 growth firms (lowest BE/ME portfolio). Again, the number of firms in the three BE/ME portfolios are not equal because the portfolio ranks are based on available data for all firms in CRSP-Compustat in any given year.

Measures of Insider Trading

We measure insider trading using two different insider purchase ratios for a firm in a given year:

$$PR_{it} = PN_{it}/(PN_{it}+SN_{it}) \quad (1)$$

and

$$PRN_{it} = PS_{it}/(PS_{it}+SS_{it}) \quad (2)$$

PR_{it} is the number of insider purchases for firm i in calendar year t as a fraction of the total number of purchases (PN_{it}) and sales (SN_{it}) in year t . PRN_{it} denotes the number of shares purchased by firm i 's insiders in year t as a fraction of the total

⁴Each firm is counted only once in a given year. The same firm can appear in the sample in other years, but it is counted once in any given year. For example, if insider trading data for a given firm are available for all four years in the merged sample, then we have four distinct firm-years of data.

⁵Firms that appear later in the calendar year in the merged CRSP-Compustat files are assigned to one of the ten size categories based on market capitalization in the month that they first appear on the merged files.

number of shares purchased (PS_{it}) and sold (SS_{it}) by i 's insiders in year t . Similar measures of insider trading can also be found in Seyhun (1990), Rozeff and Zaman (1998), and Piotroski and Roulstone (2005).

Empirical Results

We examine the information content of insider trading by linking a firm's insider trading in calendar year t (1999-2002) with the firm's market-adjusted return (MART) in year $t+1$ (2000-2003). $MART_{it}$ is calculated as the difference between firm i 's buy-and-hold return in calendar-year t minus the buy-and-hold return on the CRSP value-weighted index in year t .⁶

Table 1 reports summary statistics for our sample of 8824 firm-years. Panels A and B show that insiders tend to purchase shares of small firms and value firms. Since the size and BE/ME sorting are done independently, value firms (high BE/ME firms) tend to be much smaller than growth firms (low BE/ME firms) in our sample. Panels A and B also reveal a strong positive association between insider purchases of small and value firms in year t and high MART of such firms in year $t+1$.⁷ Small firms have higher contemporaneous MART (in year t) on average than large firms (panel A), whereas growth firms seem to have higher MART in year t than value firms. Thus the two rankings methods (size versus BE/ME rankings) do not yield identical results. The Spearman correlations between $PR_{i,t}$ and $MVE_{i,t}$, $BE/ME_{i,t}$, $MART_{i,t}$, $MART_{i,t+1}$ are -0.318, 0.240, -0.063, and 0.147, respectively. All the correlations are significant at the one percent level. Correlations between PRN_t and these variables are similar in magnitude. These correlations reveal that insiders in year t bought small stocks, value stocks, and stocks with low market-adjusted returns. The MART on the stocks that insiders purchased in year t tended to be high in year $t+1$. These results are consistent with results that have been reported in previous studies. For example, Lakonishok and Lee (2001) argue that because insiders tend to be contrarians and tend to buy small and value stocks, insider trading profits may be grossly overstated if adjustments are not made for size and BE/ME of stocks that they purchase.

⁶The conclusions of the paper do not change when the CRSP equally weighted index is used to compute the market-adjusted returns.

⁷The CRSP value-weighted market index returns during 2000-2003 were as follows: -11.03 percent (in 2000), -11.25 percent (2001), -20.84 percent (2002), and 33.13 percent (2003). The large negative market returns (between 2000-2002) partially explain the large future (year $t+1$) market-adjusted returns on stocks in which insiders were bargain-hunting. For example, a stock with a buy-and-hold return of 0 percent in year 2000 would have a market-adjusted return of 11.03 percent for the year. In a recent study of insider trading by a large institutional money management firm (Fidelity Management and Research Company), Golec (2007) reports annualized market-adjusted returns of comparable magnitude.

Panel C shows that most insider trades in our sample are insider sales. The mean PR ratio in our sample is 0.428—indicating that, on average, 42.8 percent of the insider trades are purchases. The median PR in our sample is 27.3 percent.⁸ On average, 38.9 percent of the number of shares that insiders buy or sell in our sample are buys (PRN). The median value of PRN is only 9.4 percent. The percentile distributions reveal considerable variation in all the variables.

Table 1—Summary Statistics (8824 Firm-Years)

Panel A: Average Characteristics of Firms Sorted by Size							
	Small	Mid-size	Large				
N	2312	3426	3086				
PR _t	0.643	0.414	0.284				
PRN _t	0.605	0.378	0.240				
Mean MVE _t	43.500	311.191	8194.030				
Mean BE/ME _t	1.063	0.559	0.355				
Annual MART _t	7.963%	5.111%	3.500%				
Annual MART _{t+1}	37.556%	24.343%	8.685%				

Panel B: Average Characteristics of Firms Sorted by BE/ME			
	Value (High BE/ME)	Medium	Growth (Low BE/ME)
N	2439	3430	2955
PR _t	0.584	0.425	0.304
PRN _t	0.545	0.378	0.273
Mean MVE _t	321.263	1879.520	6505.300
Mean BE/ME _t	1.355	0.534	0.113
Annual MART _t	4.249%	3.433%	8.319%
Annual MART _{t+1}	34.840%	23.699%	10.412%

Panel C: Descriptive Statistics							
	Mean	Std. Dev.	5 th Pctl.	25 th Pctl.	Median	75 th Pctl.	95 th Pctl.
PR _t	0.428	0.425	0.000	0.000	0.273	1.000	1.000
PRN _t	0.389	0.439	0.000	0.000	0.094	1.000	1.000
MVE _t	2997.902	16754.66	18.795	86.309	332.742	1182.572	10639.46
BE/ME _t	0.700	0.975	0.052	0.233	0.495	0.838	1.528
MART _t (%)	5.295	24.355	-22.130	-7.330	1.470	12.005	45.780
MART _{t+1} (%)	22.329	74.561	-55.718	-16.280	11.578	42.626	133.130

Notes: Insider trading data for year t (1999-2002) are merged with CRSP-Compustat data for year t+1 (2000-2003). PR (purchase ratio) is the ratio of the number of insider purchase transactions in year t for any given firm, divided by the total number of insider transactions (buys and sells) for the same firm during the year. PRN is the ratio of the number of shares purchased divided by the number of shares bought and sold in year t. MVE is market value of equity (\$ millions). MART_t is annualized market adjusted return for a given firm in year t. MART is computed by subtracting the annualized CRSP value-weighted market return in a year from the annualized return on a given stock in the same year. BE/ME is a firm's book-to-market equity ratio. Firms are sorted into size and BE/ME deciles in each year. The small (growth) portfolio includes firms that rank in the bottom three deciles by size (BE/ME). The large (value) portfolio includes firms that rank in the top three size (BE/ME) deciles. Firms with decile ranks 4-7 comprise the medium portfolios

⁸Rozeff and Zaman (1998) report an average PR ratio of 46.5 percent from 1978 to 1991. Piotroski and Roulstone (2005) report a mean PR ratio of 0.40 between 1992 and 1999.

We next split the sample into two groups according to insider trading behavior (mostly buying versus mostly selling) and the market-adjusted returns (negative versus positive) in order to examine univariate relations between insider trading behavior and the market-adjusted returns. The results are presented in Table 2.

Table 2 shows that insiders tend to buy stocks with relatively low contemporaneous MART and sell those with higher contemporaneous MART. Further, stocks with large insider buying (in year t) outperform those with heavy insider selling in the following year by an average of 17.97 percent. When we split the sample into two groups according to the sign of $MART_{i,t}$, we find that insiders tend to purchase more stocks with negative contemporaneous MART. This is indicative of contrarian trading by insiders. On the other hand, stocks that insiders purchase in year t tend to have high MART in year $t+1$. This is consistent with the notion that insiders have at least some ability to successfully time the market. Univariate relations between insider trading behavior and the market-adjusted returns, however, do not reveal the true sources of insider trading profits.

Table 2—Insider Trading vs. Contemporaneous and Future Market-Adjusted Stock Returns (8824 Firm-Years)

	Insider Buying (High PR and PRN)	Insider Selling (Low PR and PRN)	Difference (t-statistic)
$PR_{i,t}$	0.816	0.041	0.775 (208.62)*
$PRN_{i,t}$	0.748	0.031	0.717 (132.54)*
$MART_{i,t}$	3.962%	6.625%	-2.663% (-5.14)*
$MART_{i,t+1}$	31.325%	13.353%	17.972% (11.40)*
N	4407	4417	
	$MART_{i,t} \leq 0$	$MART_{i,t} > 0$	Difference (t-statistic)
$PR_{i,t}$	0.454	0.407	0.047 (5.18)*
$PRN_{i,t}$	0.413	0.369	0.044 (4.69)*
$MART_{i,t}$	-10.718%	18.750%	-29.468% (-31.43)*
$MART_{i,t+1}$	25.585%	19.593%	5.992% (3.76)*
N	4029	4795	
	$MART_{i,t+1} > 0$	$MART_{i,t+1} \leq 0$	Difference (t-statistic)
$PR_{i,t}$	0.471	0.362	0.109 (11.85)*
$PRN_{i,t}$	0.429	0.327	0.102 (10.71)*
$MART_{i,t}$	3.705%	7.774%	-4.069% (-8.86)*
$MART_{i,t+1}$	54.943%	-28.523%	83.466% (61.25)*
N	5376	3448	

Insider trading data for year t (1999-2002) are merged with CRSP/Compustat data for year $t+1$ (2000-2003). PR (purchase ratio) is the ratio of the number of insider purchase transactions in year t for any given firm, divided by the total number of insider transactions (buys and sells) for the same firm during the year. PRN is the ratio of the number of shares purchased divided by the number of shares bought and sold in year t . MART is annualized market adjusted return for a given firm in a given year. MART is computed by subtracting the annualized market return in a year from the annualized return on a given stock in the same year. The table reports average (mean) numbers in each cell (except for the number of observations, N)

* Significant at 1 percent

Information Content of Insider Trades

Lakonishok and Lee (2001) argue that insider trading profits are overestimated if adjustments are not made for firm size and BE/ME ratios. We use the predictive regression models of Lakonishok and Lee (2001) and Piotroski and Roulstone (2005) to examine the relative importance of the two potential sources of insider trading profits. Following the previous literature, we use three variables to capture contrarian trading behavior by insiders: firm size, BE/ME, and recent stock return.⁹ Previous studies have documented significant correlations between a firm's past long-horizon stock return and its current size and BE/ME. These are, therefore, natural candidates for proxy variables to control for contrarian trading behavior. There is also ample evidence in the literature that valuation measures such as size and BE/ME are correlated with future stock returns (Fama and French, 1993 and 1996). Thus, it may be possible for insiders to earn high future return simply by trading in a contrarian manner on observable firm characteristics such as size and BE/ME. Contemporaneous market-adjusted return (MART) for year t is used by Piotroski and Roulstone (2005) to control for contrarian trading based on recent stock return performance.

We perform the following regressions to examine whether insider trading has valuable incremental information after adjusting for contrarian trading behavior:

$$PR_{i,t}(\text{or } PRN_{i,t}) = \alpha_0 + \alpha_1 LV_{i,t} + \alpha_2 BE/ME_{i,t} + \alpha_3 MART_{i,t} + \alpha_4 MART_{i,t+1} + \varepsilon_{i,t} \quad (3)$$

$$MART_{i,t+1} = \alpha_0 + \alpha_1 PR_{i,t}(\text{or } PRN_{i,t}) + \alpha_2 LV_{i,t} + \alpha_3 BE/ME_{i,t} + \alpha_4 MART_{i,t} + \varepsilon_{i,t} \quad (4)$$

$LV_{i,t}$ is the log of firm i 's market value of equity in year t , and $MART_{i,t}$ is the difference between firm i 's buy-and-hold return in calendar-year t minus the buy-and-hold return on the CRSP value-weighted index in year t . $PR_{i,t}$, $PRN_{i,t}$, and $BE/ME_{i,t}$ are as defined earlier. We perform regression (3) to examine whether insider trading is correlated with future market-adjusted return after controlling for contrarian trading. Because insiders trade in a contrarian manner, we expect the coefficients of size ($LV_{i,t}$) and contemporaneous market-adjusted return ($MART_{i,t}$) to be negative and the coefficients of $BE/ME_{i,t}$ to be positive. If insiders trade on useful information, then the coefficients of future market-adjusted return ($MART_{i,t+1}$) should be significantly positive. Regression (4) allows one to estimate future market-adjusted returns that are related to insider trading after controlling for contrarian trading variables. Because stock returns tend to be higher for small firms and value firms (Fama and French, 1993), future market-adjusted returns should be inversely

⁹See Rozeff and Zaman (1998), Lakonishok and Lee (2001), Jenter (2005), and Piotroski and Roulstone (2005). Seyhun (1990) also uses predictive regressions to examine profits from insider trading around the stock market crash of October 1987. He uses three independent control variables in the regressions: firm size, October 1987 stock return, and the stock's pre-crash market beta. He uses the market beta to control for changes in a stock's market risk before October 1987. We do not use the beta as a control variable because the beta does not proxy for either insider information or contrarian trading by insiders.

related to size and directly related to BE/ME. If contrarian trading is profitable, then the slopes of current market-adjusted return ($MART_{it}$) should be significantly negative. The coefficients of the insider trading variables directly measure ex-ante profits from insider trades after controlling for contrarian trading.

Panel A (Table 3) reports the results of regression (3). All the control variables in Panel A have the expected signs. Insider purchase ratios are inversely related to firm size and contemporaneous market-adjusted return (MART) and positively related to BE/ME. This is consistent with prior studies that document contrarian trading behavior by insiders. The estimated coefficients for future market-adjusted returns ($MART_{t+1}$) are positive and significant, which is consistent with the notion of insiders trading on superior information. The results in Panel A reveal incremental association between insider purchases and future stock performance, even after controlling for contrarian trading behavior.

Panel B reports the results of regression (4). The results show that the control variables have the expected signs. Consistent with the models of Fama and French (1993 and 1996) and Campbell and Voulteenaho (2004), ex ante market-adjusted returns ($MART_{t+1}$) are higher for smaller firms (size premium) and value firms (value premium). The significantly negative α_4 coefficients indicate that high market-adjusted returns in year t are followed by low market-adjusted returns in year $t+1$. Therefore, a simple contrarian strategy would be profitable in our sample. The estimated coefficients for the insider trading variables are economically large and statistically significant. For PR, the estimated coefficient decreases from 0.225 without the control variables to 0.139 when all the control variables are included in the model. An estimated coefficient of 0.225 implies that the year $t+1$ market-adjusted return ($MART_{t+1}$) of stocks with all insider purchases in year t ($PR_t = 1$) is 22.5 percent higher than stocks with all insider sales in year t ($PR_t = 0$). In terms of relative explanatory power, the adjusted R^2 statistics reveal that the contrarian trading variables add to the explanatory power of the model. This is also demonstrated by the economically large reduction in the slope of PR from 22.5 percent a year to 13.9 percent a year, when the control variables are added to the model. The results for PRN are similar.

The evidence in Table 3 shows that future market-adjusted returns are significantly related to insider purchases. The difference between the year $t+1$ market-adjusted return (MART) in stocks with all insider purchases ($PR_t = 1$) in year t is 22.5 percent higher than stocks with all insider sales ($PR_t = 0$). The difference drops to a still economically (and statistically) significant 13.9 percent after adjusting for contrarian trading behavior. These profits are much larger than those that have been generally reported in the literature. In another study of insider trading profits in turbulent markets, Seyhun (1990) reports a 12-month post-October 1987 return differential between insider purchases-only and sales-only transactions of 17.2 per-

cent after controlling for the market beta of stocks. Our results in Table 3 are comparable in magnitude.

Strong Insider Buy/Sell Signals

In this section we create dummy variables to explore whether strong insider buy or sell signals generate additional future market-adjusted returns. The dummy variable for strong insider buy signal HP (HPN) is set equal to one if $PR \geq 0.95$ ($PRN \geq$

Table 3—Insider Buying and Future Stock Performance

	α_0	α_1	α_2	α_3	α_4	Adj. R^2	N
Panel A: $PR_{i,t}(\text{or } PRN_{i,t}) = \alpha_0 + \alpha_1 LV_{i,t} + \alpha_2 BE/ME_{i,t} + \alpha_3 MART_{i,t} + \alpha_4 MART_{i,t+1} + \varepsilon_{i,t}$							
$PR_{i,t}$	0.836*	-0.071*	0.012*	-0.135*	0.041*	0.126	8824
	(53.25)	(-30.43)	(2.73)	(-7.70)	(7.09)		
$PRN_{i,t}$	0.815*	-0.074*	0.010**	-0.131*	0.039*	0.123	8824
	(50.19)	(-30.59)	(2.02)	(-7.27)	(6.58)		
Panel B: $MART_{i,t+1} = \alpha_0 + \alpha_1 PR_{i,t}(\text{or } PRN_{i,t}) + \alpha_2 LV_{i,t} + \alpha_3 BE/ME_{i,t} + \alpha_4 MART_{i,t} + \varepsilon_{i,t}$							
$PR_{i,t}$	0.127*	0.225*				0.016	8824
	(11.36)	(12.14)					
	0.140*	0.218*			-0.189*	0.020	8824
	(12.29)	(11.79)			(-5.84)		
	0.435*	0.153*	-0.047*			0.029	8824
	(14.39)	(7.82)	(-10.96)				
	0.101*	0.209*		0.053*		0.021	8824
	(8.53)	(11.19)		(6.54)			
	0.425*	0.139*	-0.046*	0.030*	-0.222*	0.036	8824
	(12.90)	(7.09)	(-10.14)	(3.55)	(-6.91)		
$PRN_{i,t}$	0.142*	0.208*				0.015	8824
	(13.53)	(11.60)					
	0.155*	0.202*			-0.192*	0.019	8824
	(14.45)	(11.28)			(-5.92)		
	0.452*	0.137*	-0.048*			0.029	8824
	(15.23)	(7.26)	(-11.15)				
	0.115*	0.193*		0.054*		0.020	8824
	(10.16)	(10.69)		(6.68)			
	0.440*	0.124*	-0.046*	0.030*	-0.225*	0.035	8824
	(13.54)	(6.58)	(-10.29)	(3.61)	(-6.98)		

Notes: Insider trading data for year t (1999-2002) are merged with CRSP/Compustat data for year t+1 (2000-2003). PR (purchase ratio) is the ratio of the number of insider purchase transactions in year t for any given firm, divided by the total number of insider transactions (buys and sells) for the same firm during the year. PRN is the ratio of the number of shares purchased divided by the number of shares bought and sold in year t. LV is $\ln(\text{market value of equity in \$ millions})$. MART is annualized market adjusted returns for a given firm in a given year. MART is computed by subtracting the annualized market return in a year from the annualized return on a given stock in the same year

* Significant at 1 percent

** Significant at 5 percent

0.95) and equal to zero otherwise. The dummy for strong insider sell signal HS (HSN) is set to one when $PR \leq 0.05$ ($PRN \leq 0.05$) and to zero otherwise. We estimate the following regression:

$$MART_{i,t+1} = \alpha_0 + \alpha_1 LV_{i,t} + \alpha_2 BE/ME_{i,t} + \alpha_3 MART_{i,t} + \alpha_4 HP_{i,t} + \alpha_5 HS_{i,t} + \varepsilon_{i,t} \quad (5)$$

The results are reported in Table 4. We estimate regression (5) for all firms, and for the size and BE/ME portfolios separately. Panel A shows that strong buy signals in year t generate additional year $t+1$ market-adjusted return (MART) of 4.2 percent for all firms, over and above the year $t+1$ market-adjusted return for firms with PR_t ratios that are lower than 0.95. Similarly, strong sell signals are accompanied by 8.2 percent lower $MART_{t+1}$ (on average) than weaker sell signals. The results for the various size and BE/ME portfolios show additional future (year $t+1$) market-adjusted returns ranging from -3.7 percent to 7.6 percent associated with strong buy signals in year t . The results for the stocks with strong insider sell signals are more dramatic. Strong insider selling in year t is associated with generally lower market-adjusted returns in year $t+1$, ranging in magnitude from +1.8 percent (for small firms) to -11.9 percent (growth firms). The stock markets declined dramatically in 2000, 2001, and 2002. It is probably not surprising to see that strong insider selling during this period had such a large impact on one-year-ahead market-adjusted returns. The control variables generally have the expected signs.

Panel B shows similar results for strong insider buy (sell) signals for HPN and HSN. Strong insider buying in year t produces additional market-adjusted return in year $t+1$ of between -2 percent (growth firms) to 5.4 percent (value firms). While mostly positive, the additional market-adjusted returns are small in magnitude and statistically insignificant in all cases. Strong sell signals in year t produce relatively large negative market-adjusted returns in year $t+1$, ranging from -1.1 percent to -12.6 percent. As in Panel A, strong sell signals (especially for growth firms) have a greater impact on the future market-adjusted returns.

Determinants of Insider Trading

Our final tests examine the determinants of insider trading. Insider profits can arise from contrarian trading behavior or from useful insider information about future prospects of the firm. As insiders trade in a contrarian manner, we expect insider purchases to be negatively related to firm size and contemporaneous market-adjusted return and positively related to the firm's BE/ME ratio. If insider trades are also based upon useful information about future prospects, then insider purchases should be positively related to future market-adjusted returns.

To test these predictions we estimate the following logit regression models:

$$\begin{aligned} \text{Model 1: } \text{Logit}(P_{it}) &= \text{Log}[P_{it}/(1-P_{it})] \\ &= \alpha_0 + \alpha_1 LV_{it} + \alpha_2 BE/ME_{it} + \alpha_3 MART_{it} + \alpha_4 MART_{it+1} + \varepsilon_{it} \quad (6) \end{aligned}$$

$$\text{Model 2: } \text{Logit}(P_{1it}) = \alpha_0 + \beta_1 \text{LV}_{it} + \beta_2 \text{BE/ME}_{it} + \beta_3 \text{MART}_{it} + \beta_4 \text{MART}_{it+1} + \varepsilon_{it}$$

$$\text{Logit}(P_{1it} + P_{2it}) = \alpha_1 + \beta_1 \text{LV}_{it} + \beta_2 \text{BE/ME}_{it} + \beta_3 \text{MART}_{it} + \beta_4 \text{MART}_{it+1} + \varepsilon_{it} \quad (7)$$

Table 4—Strong Insider Buy/Sell Signals and Future Stock Price Performance (8824 Firm-years)

Panel A: $\text{MART}_{i,t+1} = \alpha_0 + \alpha_1 \text{LV}_{i,t} + \alpha_2 \text{BE/ME}_{i,t} + \alpha_3 \text{MART}_{i,t} + \alpha_4 \text{HP}_{i,t} + \alpha_5 \text{HS}_{i,t} + \varepsilon_{i,t}$							
	α_0	α_1	α_2	α_3	α_4	α_5	Adj. R^2
All Firms	0.520*	-0.049*	0.030*	-0.227*	0.042**	-0.082*	0.035
	(16.56)	(-10.87)	(3.62)	(-7.05)	(2.07)	(-4.46)	
Small Firms	0.137	0.051	0.034*	-0.064	0.050	0.018	0.003
	(1.26)	(1.88)	(2.71)	(-0.86)	(1.15)	(0.34)	
Mid-size Firms	0.394*	-0.024	0.028	-0.235*	0.062	-0.094*	0.013
	(3.11)	(-1.12)	(1.03)	(-4.28)	(1.85)	(-3.18)	
Large Firms	0.430*	-0.039*	0.049*	-0.347*	0.041	-0.095*	0.051
	(6.52)	(-4.89)	(3.19)	(-8.75)	(1.38)	(-4.58)	
Growth Firms	0.624*	-0.062*	-0.054	-0.218*	-0.037	-0.119*	0.036
	(10.16)	(-7.63)	(-1.89)	(-4.61)	(-0.87)	(-3.79)	
Medium BE/ME Firms	0.494*	-0.034*	-0.084	-0.222*	0.076**	-0.061**	0.015
	(6.28)	(-4.23)	(-0.93)	(-3.89)	(2.38)	(-2.16)	
Value Firms	0.378*	-0.020**	0.036*	-0.192**	0.069**	-0.033	0.012
	(6.64)	(-1.97)	(3.61)	(-2.57)	(2.02)	(-0.84)	
Panel B: $\text{MART}_{i,t+1} = \alpha_0 + \alpha_1 \text{LV}_{i,t} + \alpha_2 \text{BE/ME}_{i,t} + \alpha_3 \text{MART}_{i,t} + \alpha_4 \text{HPN}_{i,t} + \alpha_5 \text{HSN}_{i,t} + \varepsilon_{i,t}$							
All Firms	0.523*	-0.046*	0.031*	-0.223*	0.030	-0.100*	0.036
	(16.54)	(-10.17)	(3.64)	(-6.94)	(1.38)	(-5.11)	
Small Firms	0.149	0.051	0.034*	-0.063	0.037	-0.011	0.003
	(1.37)	(1.87)	(2.71)	(-0.85)	(0.82)	(-0.20)	
Mid-size Firms	0.387*	-0.019	0.030	-0.226*	0.051	-0.120*	0.016
	(3.07)	(-0.88)	(1.08)	(-4.12)	(1.45)	(-3.90)	
Large Firms	0.433*	-0.036*	0.049*	-0.348*	0.022	-0.107*	0.052
	(6.53)	(-4.55)	(3.18)	(-8.78)	(0.69)	(-4.46)	
Growth Firms	0.611*	-0.058*	-0.052	-0.215*	-0.020	-0.126*	0.036
	(9.82)	(-7.05)	(-1.81)	(-4.55)	(-0.45)	(-3.54)	
Medium BE/ME Firms	0.515*	-0.033*	-0.091	-0.219*	0.042	-0.083*	0.015
	(6.52)	(-4.08)	(-1.00)	(-3.84)	(1.25)	(-2.82)	
Value Firms	0.387*	-0.018	0.036*	-0.186**	0.054	-0.075	0.014
	(6.77)	(-1.71)	(3.62)	(-2.49)	(1.50)	(-1.94)	

Notes: Insider trading data for year t (1999-2002) are merged with CRSP/Compustat data for year $t+1$ (2000-2003). PR (purchase ratio) is the ratio of the number of insider purchase transactions in year t for any given firm, divided by the total number of insider transactions (buys and sells) for the same firm during the year. HP and HS are dummy variables indicating strong insider purchase ($\text{PR} \geq 0.95$) and sell ($\text{PR} \leq 0.05$) signals respectively. PRN is the ratio of the number of shares purchased divided by the number of shares bought and sold in year t . HPN and HSN are dummy variables indicating strong insider purchase ($\text{PRN} \geq 0.95$) and sell ($\text{PRN} \leq 0.05$) signals respectively. LV is $\ln(\text{market value of equity in \$ millions})$. MART is annualized market adjusted return for a given firm in a given year. MART is computed by subtracting the annualized market return in a year from the annualized return on a given stock in the same year. Firms are sorted into size and BE/ME deciles in each year. The small (growth) portfolio includes firms that rank in the bottom three deciles by size (BE/ME). The large (value) portfolio includes firms that rank in the top three size (BE/ME) deciles. Firms with decile ranks 4-7 comprise the medium portfolios

* Significant at 1 percent

** Significant at 5 percent

Model 1 estimates P_{it} , the probability of net insider purchase of stock i in year t (i.e., the probability of more insider buying than selling of stock i in year t : PR_{it} or $PRN_{it} \geq 0.5$) as a function of the four independent variables. Model 1 is estimated with 8824 firm-years of observations with reported insider trades. Model 2 estimates the relations between insider trading decisions and the independent variables using an ordered logit model with three levels of the dependent variable. P_{1it} is the probability of more insider buying than selling of stock i in year t (PR_{it} or $PRN_{it} \geq 0.5$), P_{2it} is the probability of more insider selling than buying of stock i in year t (PR_{it} or $PRN_{it} < 0.5$), and $(1 - P_{1it} - P_{2it})$ is the probability of no insider trading in stock i in year t . We first create a sample of firms using CRSP/Compustat data which do not have any reported insider trades in year t . In order to remain in our no-insider-trading sample, these firms still need to have data on all of the independent variables on the CRSP/Compustat files. There are a total of 3144 such unique firm-years in the no-insider-trading sample. Model 2 is estimated with a total of 11,968 firm-year observations (8824 with reported insider trades, and 3144 with no insider trades).

Estimates of models 1 and 2 are reported in Table 5. Panel A shows that insider purchases are negatively related to firm size and contemporaneous market-adjusted returns and positively to BE/ME and future market-adjusted returns. Thus, insiders not only trade in a contrarian manner, their trades are also based on useful information about future prospects of the firm. The likelihood ratio statistics reject the global null hypothesis that all the regression coefficients are zero. The estimates from model 2 (in Panel B) tell a similar story with one noteworthy difference. When data for the firms with no reported insider trades are included in the regressions, the estimated coefficients for BE/ME turn negative. The probability of insider trading is inversely related to firm size, BE/ME, and contemporaneous market-adjusted returns and directly related to future market-adjusted returns. Thus insiders in our sample are more likely to trade small stocks, growth stocks, stocks with low contemporaneous MART, and stocks with high future (year $t+1$) MART. The change in the sign of the coefficient for BE/ME from Panel A to Panel B indicates that while insiders are more likely to trade in growth stocks, they are more likely to purchase value stocks.

Conclusions

There is extensive evidence in the literature that trading by corporate insiders can generate abnormally high returns [e.g., Jaffe (1974), Givoly and Palmon (1985), and Seyhun (1986 and 1992)]. Insiders also are believed to be contrarian traders. [See Rozeff and Zaman (1998) and Lakonishok and Lee (2001).] The cumulative evidence in the literature seems to suggest that insider trading profits primarily arise from their tendency to trade in a contrarian manner.

Are some of these profits also due to the superior information that insiders possess about future prospects of their firms? The empirical evidence on this issue in the literature is sketchy at best. Lakonishok and Lee (2001) find that the return spread

Table 5—Determinants of Insider Trading

Panel A: Model 1 (8824 Firm-Years)

	α_0	α_1	α_2	α_3	α_4	Rescaled R ²	Likelihood Ratio
PR _{i,t}	1.761* (357.55)	-0.365* (656.14)	0.087* (7.37)	-0.744* (53.49)	0.256* (52.58)	0.157	1096.94*
PRN _{i,t}	1.645* (317.53)	-0.379* (678.90)	0.023 (0.67)	-0.657* (40.49)	0.198* (34.66)	0.149	1021.64*

Panel B: Model 2 (11968 Firm-Years)

	PR _{i,t}	PRN _{i,t}
α_0	1.321* (463.03)	1.314* (447.33)
α_1	-0.489* (66.09)	-0.681* (123.94)
β_1	-0.042* (20.36)	-0.039* (17.68)
β_2	-0.022 (2.21)	-0.032** (4.14)
β_3	-0.466* (149.98)	-0.456* (144.08)
β_4	0.142* (34.40)	0.118* (24.74)
Rescaled R ²	0.023	0.021
Likelihood Ratio	245.09*	223.01*

Notes: Insider trading data for year t (1999-2002) are merged with CRSP/Compustat data for year t+1 (2000-2003). PR (purchase ratio) is the ratio of the number of insider buy transactions in year t for any given firm, divided by the total number of insider transactions (buys and sells) for the same firm during the year. PRN is the ratio of the number of shares purchased divided by the number of shares bought and sold in year t. LV is ln(market value of equity in \$ millions). MART is annualized market adjusted return for a given firm in a given year. The likelihood ratios (Chi-Square statistics) test the global null hypothesis that all the estimated regression slopes are zero for any given model. The following ordered logistic regression models are estimated:

Model 1: (Binary Logistic Regression Model):

$$\text{Logit}(P_{it}) = \text{Log}[P_{it}/(1-P_{it})] = \alpha_0 + \alpha_1 LV_{it} + \alpha_2 BE/ME_{it} + \alpha_3 MART_{it} + \alpha_4 MART_{it+1} + \epsilon_{it}$$

where P_{it} is the probability of net insider purchase of stock i in year t (more insider buying than selling), and $(1-P_{it})$ is the probability of more insider selling than buying of stock i in year t. Wald Chi-Square statistics are reported in parentheses below the regression estimates

Model 2: (Ordinal logistic regression with 3 levels of insider trading – net buying, net selling, and no insider trading):

$$\text{Logit}(P_{1it}) = \alpha_0 + \beta_1 LV_{it} + \beta_2 BE/ME_{it} + \beta_3 MART_{it} + \beta_4 MART_{it+1} + \epsilon_{it}$$

$$\text{Logit}(P_{1it} + P_{2it}) = \alpha_1 + \beta_1 LV_{it} + \beta_2 BE/ME_{it} + \beta_3 MART_{it} + \beta_4 MART_{it+1} + \epsilon_{it}$$

where P_{1it} is the probability of net insider purchase of stock i in year t (more insider buying than selling, PR or PRN ≥ 0.5), and P_{2it} is the probability of more insider selling than buying of stock i in year t (PR or PRN < 0.5), and $(1 - P_{1it} - P_{2it})$ is the probability of no insider trading in stock i in year t. Wald Chi-Square statistics are reported in parentheses below the regression estimates

* Significant at 1 percent

** Significant at 5 percent

between stocks with extensive insider purchases and those with extensive insider sales is about 4.8 percent a year, after adjusting for firm size and BE/ME. When insiders are defined as large shareholders (beneficial owners), no return differential

is found between the two groups. Piotroski and Roulstone (2005) report that insiders trade based on both contrarian beliefs and information about future cash flows of the firm. Contrarian trading seems to be the better explanation of insider trades than private signals about future prospects. They do not directly examine the profitability of insider trades, so it is difficult to quantify from their results the trading profits that are related to useful private information. Jenter (2005) argues that insider trading profits are entirely due to contrarian trading. He finds no evidence of insider trading profits after controlling for contrarian trading behavior.

Our empirical results show that stocks that were purchased by insiders in year t (1999-2002) earned a 22.5 percent higher return in year $t+1$ than stocks that were sold by insiders in year t . The return-spread between the two groups drops to 13.9 percent after adjusting for the tendency of insiders to trade in a contrarian manner. This evidence is consistent with the notion that a substantial portion of the profits from insider trading can be attributed to superior information possessed by the insiders. We find that the profits from trading based on useful inside information (during this time period) are much larger than what have been reported in the recent literature. This evidence supports our argument that insider trading based on useful private information can be very profitable in volatile markets. Our results are comparable to Seyhun's (1990) results for insider trading profits during the market crash of October 1987. Overall, these results suggest that trading by corporate insiders should be interpreted as credible signals about the future.

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